Shortly he turned his attention to physiology, and was soon made associate professor at Königsberg. In 1849 he was called to the professorship of physiology in Vienna. Here he remained to his seventieth year as teacher and indefatigable investigator, surrounded by numerous pupils, who were inspired by his vigor and enthusiam. In 1889 he retired from active work, and died in 1892. His industry and success are somewhat indicated by the long list of scientific papers — one hundred and thirty — which he published.— C. R. B.

NOTES FOR STUDENTS.

A THIRD ARTICLE, by the colonial botanist, F. M. Bailey, enumerating the fresh-water algæ of Queensland, is issued as Botany Bulletin XV by the Queensland Department of Agriculture. The thirty-eight pages are accompanied by seventeen excellent plates from pen drawings.—J. C. A.

ITEMS OF TAXONOMIC interest are as follows: In the last fascicle of *Pittonia* (3: 329–344. 1898) Professor Greene continues his descriptions of new species of Convolvulus, nine of which are described; proposes four new species of Canadian violets, from Macoun collections; and describes a fascicle of new labiates, thirteen in number.— S. B. Parish has begun in *Erythea* (6: 85–92. 1898) a series of important papers on new or little known plants of southern California. The first one discusses about fifty plants, describing five new species and six new varieties.— J. M. C.

A NEW SPECIES of Pleodorina, *P. Illinoisensis*, is described by C. A. Kofoid in a recent Bulletin of the Illinois State Laboratory of Natural History, and illustrated with two plates showing form and development. Comparisons are made with *P. Californica*, now known from Indiana and Illinois as well as California. It is also pointed out that there are some reasons for thinking that the new form may be only a stage in the development of Eudorina, probably of *E. elegans*. We note an omission in the bibliography of the article by Severance Burrage on "A new station for Pleodorina Californica" in *Proc. Ind. Acad.* 1895: 99–100.—J. C. A.

AT A RECENT meeting of the Imperial Academy of Sciences in Vienna, Dr. Wilhelm Figdor, assistant in the institute for plant physiology of the University of Vienna, read a paper entitled "Investigations upon the phenomena of sap pressure (Blutungsdruckes) in the tropics." A summary of his results is translated from the *Österreichische Botanische Zeitschrift* 48: 359. 1898.

"1. In the tropics in contrast with the prevalent relations in our latitudes, there is always a positive sap pressure, which shows a very different intensity in the various plants observed.

"2. The amount of sap pressure attained in general is two or three times

as great as with us. The strongest pressure observed was somewhat more than eight atmospheres in *Schizolobium excelsum* Vog.

"3. The sap pressure varies, often very markedly, in one and the same plant within twenty-four hours. This phenomenon cannot be ascribed to daily periodicity alone, but must be referred to the influence of external factors, especially to the transpiration, which even in the tropics, is very copious."— C. R. B.

PROFESSOR WIESNER presented at the June meeting of the Imperial Academy of Sciences in Vienna a memoir entitled "Contributions to the knowledge of the photo-chemical climate in Arctic regions." His results (translated from *Österreichische Botanische Zeitschrift* 48: 360. 1898) are as follows:

"1. In high northern regions (Advent bay, Tromsö) the chemical intensity of the total daylight, with equal elevation of the sun and equal cloudiness, is greater than in Vienna and Cairo, but less than in Buitenzorg, Java. At Trondhjem the same is true, but with a considerably greater approximation to the conditions at Vienna.

"2. With a completely overcast sky, the intensity of the light was observed to increase much more regularly with the height of the sun at Advent bay than in any other vegetation region observed.

"3. At Advent bay with equal elevation of the sun and equal cloudiness, the chemical intensity of light in the morning and afternoon were nearly equal; however, in most cases the afternoon intensity is somewhat greater than the morning.

"4. The greatest intensity of the total daylight and the diffuse light is to be observed in all regions upon a vertical surface, which faces the sun; the smallest upon the opposite vertical surface. The intensity upon the intermediate planes lies somewhere between that of the first two.

"5. Even with a completely clear sky, the distribution of the light intensity upon the illuminated vertical plane is not completely symmetrical.

"6. With increasing elevation of the sun, the direct light (*Vorderlicht, i. e.*, the average light falling upon the vertical plane) in comparison with the sky light (*Oberlicht, i. e.*, the total daylight measured upon a horizontal plane) diminishes. In Advent bay at the beginning of August, the ratio of the direct light to the skylight is as 1 : 1.5–2.2, whereas in Vienna in May this ratio may exceed 1 : 4.

"7. For days of equal elevation of the sun at midday the daylight totals in Arctic regions are considerably greater than in temperate latitudes. At the beginning of August the average daylight total at Advent bay is about two and one-half times greater than on similar days in Vienna (at the beginning of November and February).

"8. The light climate of the high northern vegetation region is charac-

terized by a relatively greater uniformity of light intensity than is attained in any other vegetation region. This great uniformity expresses itself first in the low maxima and the high minima of the intensity of the total daylight, which again is dependent upon the course of the daily position of the sun, The daylight totals rise from spring to summer in the high Arctic regions much more slowly, and fall from summer to autumn much more slowly, than in temperate latitudes. Besides, the intensity of the direct light (*Vorderlicht*) in the north is nearer to that of the sky light (*Oberlicht*) than in other regions. The strength of the light, with complete cloudiness, increases with increasing elevation of the sun in no other region so uniformly as in the Arctic. Finally, the fact that the midnights of the north are most strongly, and those of the south most weakly, illuminated contributes to the uniformity of light intensity.

"9. The observations made at Advent bay establish the point already made by the author, that the share of the total light which plants obtain is greater the smaller the intensity of the total light is; of course, except in those regions in which the rays of the sun actually retard the development of plants (steppes and deserts). The greatest amount of the total light is received by plants of the Arctic regions. Their great need of the existing light excludes any self-shading of plants (*i. e.*, by their own leaves) in extreme northern regions, and in the neighboring southern regions (*e. g.*, in Hammerfest) only a minimal (physiological) branching of woody plants is possible."

A later memoir will concern itself with the connection of the climate thus described with the character of the vegetation.—C. R. B.

MR. U. SUSUKI, after a short exposition of his experiments in the *Botanisches Centralblatt* **75** : 289. 1898, avers that "these results leave no longer any doubt that nitrates can be assimilated and proteids formed in darkness." Dr. O. Loew adds that this confirms what he had long ago deduced from analogy in the culture of molds. Mr. Susuki's full paper will be published in the bulletin of the Agricultural College of Tokyo.—C. R. B.

IN GENERAL STYLE, Mr. F. N. Williams' recently issued *Revision of the genus Arenaria*[9] is not unlike his synoptic treatment of Silene, already noticed in these pages. Arenaria, however, is from its nature capable of more satisfactory division into subgenera and sections than Silene, and Mr. Williams seems also to have made a somewhat more detailed statement of the minor varieties and forms than in his earlier paper. He limits the genus Arenaria to the species which have estrophiolate seeds and divided or bidentate capsule-valves, thereby excluding Alsine, Mœhringia, Honkenya, etc. But, even as thus restricted, Arenaria includes the following reduced genera: *Alsinella* S. F. Gray, *Bigelowia* Raf., *Brachystemma* Don, *Brewerina* A.

[9] Journal of Linnean Society **33**: 326–437. 1898.

Gray, *Dolophragina* Fenzl, *Dufourea* Gren., *Eremogone* Fenzl, *Euthalia* Rupr., *Gouffia* Robill. & Cast., *Leptophyllum* Ehrh., *Lepyrodiclis* Fenzl, *Odontostemma* Benth., *Pettera* and *Plinthine* Reichb.,—a list sufficiently formidable to show the widely divergent views which have been held as to the generic limitations of the group.

Mr. Williams recognizes seven subgenera of which the salient characters may be summarized thus:

Euarenaria. Glands of disk obsolete; capsule-teeth 6.

Eremogoneastrum. Glands prominent; capsule dehiscent to below the middle by six valves; mostly cespitose perennials.

Pentadenaria. Glands 5; capsule 6-toothed; perennials, often suffruticose.

Dicranilla. Glands present; capsule dehiscent beyond the middle by six valves; flowers solitary, terminal, minute; S. American tufted alpine species.

Arenariastrum. Capsule dehiscent by 4 teeth; glands inconspicuous.

Odontostemma. Capsule dehiscent by 4 valves; filaments bidentate near the base.

Macrogyne. Capsule dehiscent by 4 valves; styles much exserted.

All but the last subgenus are again divided into two to five tolerably well marked sections. Our interest naturally centers upon the treatment of the North American species. Of these Mr. Williams recognizes fourteen, which he arranges thus:

Subg. EUARENARIA.

§ *Euthaliana* (with seeds granulate-tuberculate).

A. Benthamii.

A. serpyllifolia.

§ *Leiosperma* (with smooth globose, reniform, or lenticular seeds).

A. lanuginosa.

A. saxosa.

§ *Eremogoneæ* (with smooth, compressed, pyriform or oblong seeds).

A. congesta.

A. Franklinii.

A. Hookeri.

A. compacta.

A. aculeata.

Subg. PENTADENARIA.

A. ursina.

A. capillaris.

A. macradenia.

A. Fendleri.

A. ciliata.

This subdivision is certainly natural and theoretically clear. It is to be feared, however, that the gland distinction between Pentadenaria and Euare-

naria § Eremogoneæ will prove difficult, if not impossible, in practice. It will be noted that in the number and limitation of our North American species, Mr. Williams suggests scarcely any change. Of *A. Benthamii* he proposes a var. *diffusa*, based upon Mr. Heller's no. 1686 from Kerr county, Texas. Concerning *A. serpyllifolia* he says, "introduced into North America, but scarcely naturalized there;" but certainly no introduced caryophyllaceous plant except the cerastiums has taken more kindly to American soil, for it is frequent from Maine to the Pacific coast and may often be found in places quite remote from dwellings. In the subdivision of this species, var. *tenuior* Koch does not appear even in the synonymy. On page 412, *A. ursina* is again separated from *A. capillaris*, on the ground that "none of the many forms of *A. capillaris* have glaucous leaves and emarginate petals." But the emarginate character of the petals is not a strong one and on a succeeding page Mr. Williams himself says, "As Ledebour points out, typical *A. capillaris*, which is widely distributed in Siberia, is a glabrous plant with short barren shoots and rigid glaucous leaves."

From Mexico Mr. Williams recognizes nine species and six varieties, his *A. megalantha* (*A. lanuginosa* var. *megalantha* Rohrb., *A. alsinoides* var. *ovalifolia* J. D. Smith) being new in conception.

In a prefatory note it is stated that in the spelling of geographic names the "Times" atlas has been followed. We are unacquainted with this work but should not place implicit confidence in it if "Chinautla" and "Sempaaltepec" are samples of its orthography.

Once more it must be said that Mr. Williams could add greatly to the value of his papers through citing by numbers a few authentic specimens under each species and variety. However, the treatment of Arenaria shows on the whole even more to praise and less to criticise than that of Silene. —B. L. ROBINSON.

A RECENT work of Cavara[10] deals largely with the finer structure of the nucleolus. *Ornithogalum umbellatum*, *Cucurbita maxima*, *Crinum giganteum*, *Narcissus poeticus*, *Lilium Martagon*, and others, furnished material. Absolute alcohol, alcoholic corrosive sublimate, Carnoy's fluid and Merkel's fluid were the principal fixing agents. Zimmerman's iodine-green and fuchsin was recommended for staining on account of its rapid and effective work, but many other stains were used including the methyl-green-eosin-orange of Erlich, and Flemming's safranin-gentian-violet-orange. Celloidin was used for embedding.

He believes that nucleoli are not thrust out but are taken up by the nuclear thread. A series of figures, apparently somewhat diagrammatic, represents the nucleoli in great detail, but the nuclear thread does not receive equal

[10] CAVARA, F.—Intorno ad alcune strutture nucleari. Atti dell' Istituto botanico della R. Università di Pavia II. 5: 1–49. *pl. 2.* 1898.

attention. During mitosis the structure of the nucleolus is lost, its staining power is lessened and it breaks up into small pieces which show no staining capacity. These pieces are taken up by the nuclear thread and are to be regarded as condensation bodies of nutritive material. They may form plastin for spindles or chromatin for chromosomes. He says that this view resembles that of Hertwig, Flemming, and others. If it should be correct, it argues against the individuality of chromosomes.—C. J. CHAMBERLAIN.

IN THE WINTER of 1895–6, Börgesen and Paulsen carried on some important ecological studies in the West Indies. The results of their investigations have been published only recently.[11] The work is divided into two main parts: I. The halophytic vegetation, by Börgesen; II. The forests and thickets, by Paulsen. In addition there is an appendix containing a statement of the new spermatophytes, and a list of the algæ and fungi observed. The book is fully illustrated with eleven full-page plates from Börgesen's photographs, and many text figures.

The halophytic vegetation is treated of under five heads: 1. *The sea weeds.* Of chief importance are the Halimeda and Caulerpa forms, growing so densely as to form a solid mass. Some extraordinary Caulerpas are described, one closely resembling *Carex arenaria* in its external form. Its creeping, sharp-cornered stem sends out assimilation shoots and rootlets.

2. *The vegetation of the sandy beaches.* These beaches are composed principally of coral fragments, lime, and particles of limy algæ. On account of the weight of these sand grains no dunes are formed, even by the strongest winds. All the plants are protected in various ways against loss of water. The blades of grass are rolled up, and on other plants the leaves are bluish-gray and often very fleshy. Their elliptical or spatulate forms also give a small proportion of leaf exposure. The runners are above ground, as there is no danger of harm by flying sand. The Canavalia has dorsiventral leaves, the epidermis is provided with glandular, bristly hairs, some of the cells are arranged as stomata but do not function as such, and become crystal bearing. The Cocoloba has brilliant, upward turned leaves, the upper epidermis is strongly cuticularized, without stomata, and is impregnated with tannic acid. Many other forms are described, some having water cells, oil glands, cells containing calcium oxalate crystals, etc.

3. *The vegetation of the rocky coasts*, consisting of characteristic agaves, cacti, bromelias, and croton forms.

4. *The mangrove vegetation*, surrounding and encroaching upon all the bays, brackish lakes, and salt ponds, wherever there is found protected water. One of the most prominent forms is the Rhizophora, which has two kinds of aerial roots. Some spring from the principal stem standing at right angles

[11] The vegetation of the Danish West Indies. Copenhagen. 1898. *Cf.* Bot. Centralbl. **74**: 143. 1898.

and later turning downwards. The others grow from the branches of the tree perpendicularly downwards, branching at the surface of the water where the tips die and decay. The structure of these aerial roots is fully described.

5. *The vegetation of the salt clay plains.* These stretches surround the lagoons and salt ponds and upon them is an overflow of some of the forms described above. In drier localities live some herbaceous forms and some of those growing erect on the beaches are here recumbent.

Under the forest and thicket vegetation each island is discussed separately. The Hurricane island, which forms the western boundary of the harbor of St. Thomas, is sparsely inhabited and mostly covered with a xerophytic vegetation, whose density is increased by thorn growths and lianas. The trees are generally smooth leaved, the shrubs hairy leaved, and the most important succulents are the agaves, bromelias, and some opuntias.

In the interior of the island of St. Thomas grow many croton bushes, as well as forests of larger trees, a long list of which is given. Epiphytic orchids, arums and ferns also abound, *Cuscuta Americana* being especially widespread. St. John is very fertile, though little cultivated on account of the indolence of the natives.

Lately some promising experiments with the cultivation of coffee and cocoa have been undertaken. The croton underbrush has been pretty well crowded out of this island, and there are great grassy stretches near the deeper forests. St. Croix is the most important of the Danish Antilles, and is the chief seat of the Danish cane-sugar industry. In the uncultivated portions the vegetation is similar to that of the other islands. Upon the fallow fields the weeds are always woody. The gray crotons cover most of the eastern half of the island, and are more xerophytic and smaller than elsewhere. Only a few trees are found, and lianas are scarce, but the succulents richly supply their place. The chief characteristic of the vegetation is its xerophytic adaptation. With the exception of the legumes, the leaves are entire, stiffy haired, usually ovate and short stemmed. Thorns of every sort abound. In the valleys we find the luxuriant vegetation of the tropics, oranges, figs, etc. Upon the trees was seen the Tillandsia, and in damp places Psilotum and *Pilea macrophylla.*

In the last division of the second part the author treats of the anatomy of the xerophytic foliage leaves, having investigated three groups: (1) the decidedly hairy leaves; (2) the slightly hairy and smooth leaves; (3) two types of leguminous leaves. He thinks the structure of the smooth leaves not anatomically different from that of the hairy leaves, but the outer epidermal walls are very much thicker. This is also true of the leguminous leaves. The abundant glandular hairs are depressed on the smooth leaves, and stand among the other hairs on the hairy leaves. They closely resemble the hydathodes described by Haberlandt. The leaf anatomy of *Evolvulus nummularis* and of *Loranthus emarginatus* is fully described.—S. M. COULTER.